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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/593,098	10/24/2006	Susumu Kitagawa	1034228-000002	7829

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EXAMINER	
BOYLE, ROBERT C	

ART UNIT	PAPER NUMBER
1796	

NOTIFICATION DATE	DELIVERY MODE
03/01/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/593,098	KITAGAWA ET AL.	
	Examiner	Art Unit	
	ROBERT C. BOYLE	1796	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 January 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17,21-26 and 28-41* is/are pending in the application.

4a) Of the above claim(s) *30-34* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17, 21-26, 28-29, 35-41* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. The new grounds of rejection set forth below are necessitated by applicant's amendment filed on 1/13/2010. In particular, claims 1 and 35 have been amended to include the limitations from claim 20, the pillar ligand is pyrazine, and claim 27, the structure is one of a plate-like crystal and a granular crystal. This presents the claims in a manner with a scope not previously examined. Thus, the following action is properly made FINAL.

Claim Rejections - 35 USC § 103

3. Claims 1-17, 21-26, 28-29, 35-38, 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Uemura** et al., "Formation of a One-Dimentional Array of Oxygen in a Nonchannel of a Porous Coordination Polymer", Polymer Preprints, 2003, pp 2837-2838, Vol. 52, No. 11 ("Uemura Poly Pre") cited in the IDS filed August 21, 2009. The English translation provided by the Applicant is used for citation purposes.

4. As to claims 1-2, Uemura Poly Pre teaches a porous organometallic complex, $[Cu_2(pzdc)_2(pyz)]$ where pzdc is pyrazine dicarboxylate and pyz is pyrazine and the complex is in the presence of polyvinylsulfonic acid ("PVSA") (first page; third page). Uemura Poly Pre does not teach the structure is a plate-like crystal or granular crystal.

5. However, Uemura Poly Pre teaches nanowires (third page). It would have been obvious to one of ordinary skill in the art that halting the crystallization of nanowires while the length of

the crystal was still near the thickness of the nanowire would result in a granular crystal as opposed to a "wire".

6. As to claims 2-17, 21-26, 28-29, 35-38, 41, the discussion of the limitations of these claims presented in the Office Action mailed 10/16/2009, ¶ 21-39, is incorporated here by reference.

7. Claims 1-17, 21-26, 28-29, 35-38, 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Uemura** et al., "Formation of a One-Dimentional Array of Oxygen in a Nonchannel of a Porous Coordination Polymer", Polymer Preprints, 2003, pp 2837-2838, Vol. 52, No. 11 ("Uemura Poly Pre") cited in the IDS filed August 21, 2009, in view of **Ulrich**, Crystallization, Kirk-Othmer Encyclopedia of Chemical Technology, August, 2002, pg. 95-147. The English translation provided by the Applicant is used for citation purposes.

8. As to claims 1-2, Uemura Poly Pre teaches a porous organometallic complex, $[Cu_2(pzdc)_2(pyz)]$ where pzdc is pyrazine dicarboxylate and pyz is pyrazine and the complex is in the presence of polyvinylsulfonic acid ("PVSA") (first page; third page). Uemura Poly Pre does not teach the structure is a plate-like crystal or granular crystal.

9. However, Ulrich recognizes the morphology of a crystalline structure is dependent on several variables, space group, growth rates, impurities, rates of cooling, temperature, solvent, mixing and supersaturation (pg. 113-114).

10. It is the examiner's position that crystal shape is a result effective variable because changing them will clearly affect the type of product obtained. See MPEP 2144.05(B). Case law holds that "discovery of an optimum value of a result effective variable in a known process is

ordinarily within the skill of the art." See *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In view of this, it would have been obvious to one of ordinary skill in the art to utilize the conditions within the scope of the present claims so as to produce desired end results.

11. In the alternative, MPEP 2141 and 2143 state that exemplary rationales that may support a conclusion of obviousness include:

(A) Combining prior art elements according to known methods to yield predictable results;
(B) Simple substitution of one known element for another to obtain predictable results;
(C) Use of known technique to improve similar devices (methods, or products) in the same way;
(D) Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;
(E) " Obvious to try " – choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;
(F) Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art;
(G) Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention. See MPEP § 214 3 for a discussion of the rationales listed above along with examples illustrating how the cited rationales may be used to support a finding of obviousness.

12. It would have been obvious to apply the known crystallization techniques of Ulrich to the known product of Uemura Poly Pre to yield predictable results, the formation of plate-like crystals or granular crystals.

13. As to claims 2-17, 21-26, 28-29, 35-38, 41, the discussion of the limitations of these claims presented in the Office Action mailed 10/16/2009, ¶ 21-39, is incorporated here by reference.

14. Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Uemura Poly Pre** in view of **Uemura** et al., J.Am.Chem.Soc. 2003, 125, 7814-7815 ("Uemura JACS"). The discussion with respect to Uemura Poly Pre and Uemura JACS as set forth in paragraphs 16-40 above is incorporated here by reference.

15. As to claim 37, Uemura Poly Pre teaches a porous organometallic complex, $[Cu_2(pzdc)_2(pyz)]$ where pzdc is pyrazine dicarboxylate and pyz is pyrazine and the complex is in the presence of polyvinylsulfonic acid ("PVSA") (first page; third page). Uemura PolyPre does not teach the ratio of ingredients.

16. Uemura JACS discloses mixing a metal ion with the organic molecules in a ratio of 1:20 (pages 7814-15). It would have been obvious to one of ordinary skill in the art to use the ratio of Uemura JACS with the compound of Uemura PolyPre because Uemura JACS teaches a more organic molecules result in smaller, more uniform particles (Uemura JACS: figure 1).

17. Claims 39-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Uemura Poly Pre** in view of **Ulrich** and **Anderson** (US 4,818,898). The discussion with respect to Uemura Poly Pre as set forth in paragraphs 3-16 above is incorporated here by reference.

18. As to claims 39-40, Uemura Poly Pre teaches a porous organometallic complex, $[Cu_2(pzdc)_2(pyz)]$ where pzdc is pyrazine dicarboxylate and pyz is pyrazine and the complex is in the presence of polyvinylsulfonic acid ("PVSA") (first page; third page). Uemura PolyPre does not teach applying pressure to a crystal or powder.

19. Anderson teaches applying pressure or molding crystals (col. 7, lines 30-35). It would have been obvious to one skilled in the art that pressure could be applied via fingers. It would

have been obvious to apply pressure because orienting organometallic lattices allows for adjusting properties such as optical scattering (col. 7, lines 26-39).

20. Claims 1-23, 27-29, 35-36, 38, and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Kondo** et al., *Angew. Chem. Int. Ed.* 1999, 38 in view of **Moulton** et al., Chem Rev. 2001, 101, 1629 and **Ulrich**, Crystallization, Kirk-Othmer Encyclopedia of Chemical Technology, August, 2002, pg. 95-147.

21. As to claim 1, Kondo teaches the synthesis of $[Cu_2(pzdc)_2(L)]xH_2O$, where pzdc = pyrazine-2,3-dicarboxylate, L = pyrazine (see scheme 1). The corresponding structure is porous (figure 2). Kondo does not teach an organic polymer.

22. Moulton teaches using coordination polymers to engineer crystals networks (page 1632, section II). It would have been obvious to use the coordination polymers of Moulton with the organometallic compound of Kondo because both teach forming lattice compounds with pores and Moulton teaches that the use of coordination polymers allows a diversity of structures and modification of the inherent cavities giving high levels of porosity and thermal stability (pages 1632-33).

23. Kondo and Moulton do not teach the crystalline structure. However, Ulrich recognizes the morphology of a crystalline structure is dependent on several variables, space group, growth rates, impurities, rates of cooling, temperature, solvent, mixing and supersaturation (pg. 113-114).

24. It is the examiner's position that crystal shape is a result effective variable because changing them will clearly affect the type of product obtained. See MPEP 2144.05(B). Case law

holds that "discovery of an optimum value of a result effective variable in a known process is ordinarily within the skill of the art." See *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In view of this, it would have been obvious to one of ordinary skill in the art to utilize the conditions within the scope of the present claims so as to produce desired end results.

25. In the alternative, MPEP 2141 and 2143 state that exemplary rationales that may support a conclusion of obviousness include:

(A) Combining prior art elements according to known methods to yield predictable results;
(B) Simple substitution of one known element for another to obtain predictable results;
(C) Use of known technique to improve similar devices (methods, or products) in the same way;
(D) Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;
(E) " Obvious to try " – choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;
(F) Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art;
(G) Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention. See MPEP § 214 3 for a discussion of the rationales listed above along with examples illustrating how the cited rationales may be used to support a finding of obviousness.

26. It would have been obvious to apply the known crystallization techniques of Ulrich to the known product of Uemura Poly Pre to yield predictable results, the formation of plate-like crystals or granular crystals.

27. As to claims 2-17, 21-23, 28-29, 35-36, 38, 41, the discussion of the limitations of these claims presented in the Office Action mailed 10/16/2009, ¶ 47-68, is incorporated here by reference.

28. Claims 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Kondo** et al., *Angew. Chem. Int. Ed.* 1999, 38 in view of **Moulton**, **Ulrich** and **Millich** et al., *J. Phys. Chem.* 1962, 66(6), 1070. The discussion with respect to Kondo, Ulrich and Moulton as set forth in paragraphs 20-27 above is incorporated here by reference.

29. As to claims 24-26, Kondo teaches the synthesis of $[Cu_2(pzdc)_2(L)]xH_2O$, where pzdc = pyrazine-2,3-dicarboxylate, L = pyrazine (see scheme 1). Moulton teaches using coordination polymers to engineer crystals networks (page 1632, section II). Kondo and Moulton do not teach the use of ionic polymers.

30. Millich teaches using polyvinylsulfonic acid (PVSA) in the interaction of metal ions, including Cu (see page 1072, section C). It would have been obvious to use the polymers of Millich with the complex of Kondo and Moulton because Kondo forms a repeating, crystalline organometallic complex structure and is concerned about controlling the characteristics of the structures of the network (Kondo: figure 2; page 142) and Moulton teaches supramolecular isomerism and polymorphism in complex networks (Moulton: abstract) and using coordination polymers to guide crystal self assembly (Moulton: section II, page 1623) and Millich teaches coacervation polymers to coordinate metal ions (see page 1072, section C) and coacervation polymers are the type of coordination polymers necessary to guide self assembly because they help separate out components into different phases.

31. Claims 1-23, 27-29, 35-38, 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Kondo** in view of **Ulrich** and **Uemura JACS**.

32. As to claim 1, Kondo teaches the synthesis of $[Cu_2(pzdc)_2(L)]xH_2O$, where pzdc = pyrazine-2,3-dicarboxylate, L = pyrazine (see scheme 1). The corresponding structure is porous (figure 2). Kondo does not teach an organic polymer.

33. Uemura JACS teaches using an organic polymer to form an organometallic structure (pages 7814-7815). It would have been obvious to one of ordinary skill in the art to use the organic polymer of Uemura JACS with the complex of Kondo because the organic polymer provides steric stabilization during growth processes (page 7814).

34. Kondo and Uemura JACS do not teach the crystalline structure. However, Ulrich recognizes the morphology of a crystalline structure is dependent on several variables, space group, growth rates, impurities, rates of cooling, temperature, solvent, mixing and supersaturation (pg. 113-114).

35. It is the examiner's position that crystal shape is a result effective variable because changing them will clearly affect the type of product obtained. See MPEP 2144.05(B). Case law holds that "discovery of an optimum value of a result effective variable in a known process is ordinarily within the skill of the art." See *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In view of this, it would have been obvious to one of ordinary skill in the art to utilize the conditions within the scope of the present claims so as to produce desired end results.

36. In the alternative, MPEP 2141 and 2143 state that exemplary rationales that may support a conclusion of obviousness include:

(A) Combining prior art elements according to known methods to yield predictable results;
(B) Simple substitution of one known element for another to obtain predictable results;
(C) Use of known technique to improve similar devices (methods, or products) in the same way;

(D) Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;
(E) " Obvious to try " – choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;
(F) Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art;
(G) Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention. See MPEP § 214 3 for a discussion of the rationales listed above along with examples illustrating how the cited rationales may be used to support a finding of obviousness.

37. It would have been obvious to apply the known crystallization techniques of Ulrich to the known product of Uemura Poly Pre to yield predictable results, the formation of plate-like crystals or granular crystals.

38. As to claims 2-17, 21-23, 28-29, 35-36, 38, 41, the discussion of the limitations of these claims presented in the Office Action mailed 10/16/2009, ¶ 47-68, is incorporated here by reference.

39. Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Kondo** and **Moulton** in view of **Uemura JACS** and **Ulrich**. The discussion with respect to Kondo, Ulrich, Moulton and Uemura JACS as set forth in paragraphs 31-38 above is incorporated here by reference.

40. As to claim 37, Kondo teaches the synthesis of $[Cu_2(pzdc)_2(L)]xH_2O$, where pzdc = pyrazine-2,3-dicarboxylate, L = pyrazine (see scheme 1). Moulton teaches using coordination polymers to engineer crystals networks (page 1632, section II). Kondo and Moulton do not teach teach the ratio of ingredients.

41. Uemura JACS discloses mixing a metal ion with the organic molecules in a ratio of 1:20 (pages 7814-15). It would have been obvious to one of ordinary skill in the art to use the ratio of Uemura JACS with the complex of Kondo and Moulton because Uemura JACS teaches more organic molecules result in smaller, more uniform particles (Uemura JACS: figure 1).

42. Claims 39-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Kondo** and **Moulton** in view of **Anderson** and **Ulrich**. The discussion with respect to Kondo, Ulrich, and Moulton as set forth in paragraphs 31-41 above is incorporated here by reference.

43. As to claims 39-40, Kondo teaches the synthesis of $[Cu_2(pzdc)_2(L)]xH_2O$, where pzdc = pyrazine-2,3-dicarboxylate, L = pyrazine (see scheme 1). Moulton teaches using coordination polymers to engineer crystals networks (page 1632, section II). Kondo and Moulton do not teach applying pressure to a crystal or powder.

44. Anderson teaches applying pressure or molding crystals (col. 7, lines 30-35). It would have been obvious to one skilled in the art that pressure could be applied via fingers. It would have been obvious to apply pressure because orienting organometallic lattices allows for adjusting properties such as optical scattering (col. 7, lines 26-39).

Response to Arguments

45. Applicant's arguments with respect to Kondo and Uemura Poly Pre have been considered but are moot in view of the new ground(s) of rejection.

46. It is noted that Applicant has amended claim 1 to include the crystal forms, plate like or granular, and that neither primary reference Kondo or Uemura Poly Pre teach the crystal forms

claimed. However, it is the examiner's position that crystallization is a routine technique practiced in the field, and is subject to predictable results on routine experimentation (see Ulrich). Evidence or argument establishing otherwise has not been presented.

47. Applicant has argued that "various shapes are possible depending on how to grow the crystal of the organometallilc complex structure, which is not limited only by the type of pillar ligands" (see Remarks filed 1/13/2010, pg. 14). However, this argument does not establish the non-obviousness or unpredictability of various shapes as presented by Ulrich, whether the shapes are plate-like or nanowires.

Conclusion

48. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROBERT C. BOYLE whose telephone number is (571)270-7347. The examiner can normally be reached on Monday-Thursday, 9:00AM-5:00PM Eastern.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vasu Jagannathan can be reached on (571)272-1119. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Robert C. Boyle/
Examiner, Art Unit 1796

/Vasu Jagannathan/
Supervisory Patent Examiner, Art Unit 1796